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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/809,463	07/18/1997	MITSUHIRO NAKAMURA	P97.0322	7619

7590

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DAVID R. METZGER, ESQ.  
SONNENSCHN, NATH & ROSENTHAL  
P.O. BOX 061080  
WACKER DRIVER STATION, SEARS TOWER  
CHICAGO, IL 60606-1080

EXAMINER

CAO, PHAT X

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 05/08/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

08/809,463

Applicant(s)

Nakamura et al.

Examiner

Phat X. Cao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on Nov 13, 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☒ All b) ☐ Some\* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892) 18) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 19) ☐ Notice of Informal Patent Application (PTO-152)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). \_\_\_\_\_ 20) ☐ Other: \_\_\_\_\_

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## **DETAILED ACTION**

### ***Continued Prosecution Application***

1. The request filed on 11/13/01 for a Continued Prosecution Application (CPA) under 37 CFR 1.53(d) based on parent Application No. 08/809,463 is acceptable and a CPA has been established. An action on the CPA follows.

### ***Claim Objections***

2. Claims 7 and 17 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

- In claim 7, a limitation "and said metal nitride film is a WN film, ... or a TiON film" fails to further limit the subject matter in the base claim 1.

- Similarly, in claim 17, a limitation "and said metal nitride film is a WN film, ... or a TiON film" fails to further limitation in the base claim 10.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-3, 9-13, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Jackson et al (US. 5,098,859) in view of Twynam et al (US. 5,508,536).

Jackson discloses a device including a GaAs substrate, a non-single crystal semiconductor layer comprising In (see, for example, "EXAMPLE 3" as well as col. 5, line 56), and an uppermost conductive film made of WSi. With respect to claims 9 and 19, note figure 2.

Jackson fails to teach the claimed details of the uppermost conductive film.

However, Twynam teaches a metal structure including a WN or WSi film 10 for making contact with III-V semiconductor region 7 comprising In (column 6, lines 51-54). Twynam teaches that such a contact structure allows for improving heat resistance to enhance reliability because of forming of a heat resisting metal WN (column 5, lines 13-18). Accordingly, from the suggestion of Jackson that "the metal is not critical and any metal will make a good contact" (column 6, lines 7-10) and from the teaching of Twynam that the heat resisting metal includes WSi or WN for making contact with III-V semiconductor layer comprising In (i.e., InGaAs), it would have been obvious to one skilled in the art at the time the invention was made to substitute the heat resisting metal of WN as taught by Twynam because according to Twynam, both WSi and WN can be used to contact III-V semiconductor layer comprising In for improving heat resistance to enhance reliability (column 5, lines 13-18).

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5. Claims 4-8 and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson and Twynam as applied to claim (1,10) above, and further in view of Nirschl et al (DE 41 29 647 A1).

With respect to claims 4-6 and 14-16, the combination of Jackson and Twynam substantially reads on the above claims, except that it fails to disclose the uppermost conductive film comprising a metallization series as claimed.

However, Nirschl teaches a metal structure for making contact with III-V semiconductor regions. Nirschl's structure includes a metallization series comprising: a first metal layer (2), a nitride layer (5), a refractory metal film (6) of titanium (see page 7, lines 18-19 of English translation) and a second metal layer (4). Accordingly, it would have been obvious to one skilled in the art at the time the invention was made to form the device as disclosed by Jackson with a conductive film structure as taught by Nirschl because according to Nirschl, such metallization series are necessary to create connectors for electrical contact on the surface of III-V semiconductors (page 2, lines 3-6 of English translation), especially for optoelectronics semiconductor chips (page 11, lines 1 of English translation), in order to allow for reliable high temperature operation (page 8, lines 8-12 of English translation).

With respect to claims 8 and 18, Nirschl teaches the use of titanium refractory metal other than the use of refractory metals of W, Ta, and Mo as claimed. However, because W, Ta, Mo and Ti are well known refractory metals and commonly used in the art for the well known purpose of reducing the contact resistances, it would have been obvious to select W, Ta, or

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Mo for Ishihara's Ti because of their equivalence for their use in the semiconductor art as conductive materials and the selection of any of these known equivalents to be used as a low resistivity conductive material would be within the level of skill in the art.

With respect to claims 7 and 17, while Nirschl uses a metal other than those claimed by Applicant, the claimed metals are well known in the art and their use in Nirschl's structure would have been obvious to a skilled artisan at the time of invention as a result of routine engineering design, optimization, and implementation considerations.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (703) 308-4917. The Examiner can normally be reached on Monday through Thursday. If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956. Group 2800 fax number is (703) 308-7722 or (703) 308-7724.

PC

May 6, 2002

  
PHAT X. CAO  
PRIMARY EXAMINER